Assessment Schedule – 2006

Statistics and Modelling: Calculate confidence intervals for population parameters (90642)

Evidence Statement

	Achievement Criteria	Q	Evidence	Code	Judgement	Sufficiency
Achievement	Calculate confidence intervals for population parameters.	1	0.474± 0.044 or $0.43 < \pi < 0.52$	A	Accept any rounding more than 1Sig Fig. for all 3 intervals.	Two of Code A. Must be different types of interval
		2	103.48 ± 9.98 $\$93.50 < \mu < \$113.46$	A	Accept intervals written in equivalent forms.	
		3	12.24 ± 13.21 or $-\$0.97 < \mu_1 - \mu_2 < \$25.45$	A	Ignore units.	
Achievement with Merit	Demonstrate an understanding of confidence intervals.	4	Answer: No. 50% lies in this interval so there is not enough evidence to conclude the percentage is more than 50.	M	Or equivalent.	Three of code M ***or*** Achievement plus two of code M.
		5	$4 \times 265 = 1060$ or a correct calculation (eg using $z = 2.58$, $\sigma = 47.14$, $e = 3.73$ leading to $n = 1064$) $z = 2.576$ then $n = 1060$ $z = 2.574$ then $n = 1059$ $z = 2.57$ then $n = 1055$	M	Accept equivalent if calculating, but must round up.	
		6	$-\$14.78 < \mu_1 - \mu_2 < \$5.00$ Answer: No, since 0 lies in the interval, there is not enough evidence to conclude there is a significant difference.	M	Accept as evidence for A. Or equivalent. Interval and decision required. Accept any rounding more than 1Sig Fig. for all intervals. Accept intervals written in equivalent forms. Ignore units.	

Achievement with Excellence	Demonstrate an understanding of the theory behind confidence intervals.	7	Eg: For the Art Gallery an estimate for N (population size) is 4 503. This gives a 99% CI for T (total donations, 3SF) as \$421 000 < T < \$511 000. Since \$400 000 lies outside this interval there is enough evidence to conclude that total donations will exceed \$400 000, and this supports a decision to go ahead with the project. For the Sports Complex an estimate for N is 5 035. This gives a 99% CI for T (total donations, 3SF) as \$437 000 < T < \$512 000. Since \$500 000 lies in this interval, there is not enough evidence to conclude that total donations will exceed \$500 000, and this does not provide strong support for a decision to go ahead with the project. Alternative working: 99% CI for art gallery is 93.497 < μ < 113.46 expected support for Art Gallery is 19 x 237 = 4503 99% CI for donations for Art Gallery is therefore: 421016.99 < μ < 510910.38 99% CI for sports complex is 86.73 < μ < 101.64 expected support for Sports Complex is 19 x 265 = 5035 99% CI for donations for Sports Complex is therefore: 436685.55 < μ < 511757.4 Conclusion as above.	E	For excellence there must be the following: • A correct calculation of 99% confidence intervals for total donations for both projects. • A consistent decision identifying that only the Art Gallery project should go ahead (either by referring to both projects or stating the Art Gallery, thus implying not the Sports Complex). Accept an approach that analyses lower limits of confidence intervals only. Accept other statistically correct approaches (eg hypothesis tests, normal probability calculations) that lead to consistent decisions. Accept a correct interval for a total for M. Accept a correct interval for either AG or SC as replacement evidence for A	Merit plus code E.

For question 7, the correct interval is: $T \pm z \times \sqrt{a^2 \text{Var}(T)}$

$$\Rightarrow T \pm z \times 19\sqrt{n}\,\sigma$$

Judgement Statement

Statistics and Modelling: Calculate confidence intervals for population parameters (90642)

Achievement	Achievement with Merit	Achievement with Excellence
Calculate confidence intervals for population parameters. 2 × A Must be different types of intervals.	Demonstrate an understanding of confidence intervals. Achievement *plus* 2 × M **OR** 3 × M	Demonstrate an understanding of the theory behind confidence intervals. Merit *plus* 1 × E